STREAM INVENTORY REPORT

South Fork Usal Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on South Fork Usal Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in South Fork Usal Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. There is no known record of adult spawning surveys having been conducted on South Fork Usal Creek.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for chinook salmon, coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

South Fork Usal Creek is tributary to Usal Creek, tributary to the Pacific Ocean, located in Mendocino County, California (Figure 1). South Fork Usal Creek's legal description at the confluence with Usal Creek is T23N R18W. Its location is 39°50′30″ north latitude and 123°49′45″ west longitude. South Fork Usal Creek is a second order stream and has approximately 3.2 miles of blue line stream according to the USGS Hales Grove 7.5 minute quadrangle. South Fork Usal Creek drains a watershed of approximately 8.0 square miles. Summer base runoff is approximately 1.2 cubic feet per second (cfs) at the mouth. Elevations range from about 30 feet at the mouth of the creek to 2000 feet in the headwater areas. Redwood and Douglas fir forest dominates the watershed. The watershed is privately owned and is managed for timber production. Vehicle access exists via private road from State Route 1.

METHODS

The habitat inventory conducted in South Fork Usal Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). South Fork Usal Creek personnel were trained in May, 1995, by Gary Flosi. This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in South Fork Usal Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". South Fork Usal Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for

all features on the sampling form (*Sampling Levels for Fish Habitat Inventory*, Hopelain, 1995). Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In South Fork Usal Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In South Fork Usal Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two respectively.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In South Fork Usal Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In South Fork Usal Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) of both the right and left banks for each fully-

described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In South Fork Usal Creek fish presence was observed from the stream banks, and two sites were electrofished using one Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for South Fork Usal Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of August 8-16, 1995, was conducted by Heidi Hickethier (WSP/AmeriCorps) and Don Hickethier and Craig Mesman (CCC). The total length of the stream surveyed was 18,997 feet with an additional 550 feet of side channel.

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Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.2 cfs on August 18, 1995.

South Fork Usal Creek is a C4 channel type for the first 2,857 feet of stream surveyed and an F4 channel type for the remaining 16,140 feet of stream reach surveyed. C4 channels are low-gradient, meandering, riffle/pool, alluvial channels with broad, well-defined floodplains and gravel-dominant substrates. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures ranged from 56 to 61 degrees Fahrenheit. Air temperatures ranged from 57 to 76 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 44% pool units, 32% riffle units, and 23% flatwater units (Graph 1). Based on total **length** of Level II habitat types there were 35% pool units, 33% flatwater units, and 27% riffle units (Graph 2).

Sixteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low-gradient riffles, 32%; mid-channel pools, 30%; and step runs, 11% (Graph 3). Based on percent total **length**, low-gradient riffles made up 27%, mid-channel pools 24%, and step runs 22%.

A total of 236 pools were identified (Table 3). Main channel pools were most frequently encountered at 70% and comprised 69% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Seventy-four of the 236 pools (31%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 219 pool tail-outs measured, 17 had a value of 1 (8%); 62 had a value of 2 (28%); 122 had a value of 3 (56%); and 18 had a value of 4 (8%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool habitat types had a mean shelter rating of 33, and flatwater habitats had a mean shelter rating of 26 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 45. Main channel pools had a mean shelter rating of 34 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in South Fork Usal Creek. Graph 7 describes the pool cover in South Fork Usal Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in all of the 17 low-gradient riffles measured (100%)(Graph 8).

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The mean percent canopy density for the stream reach surveyed was 97%. The mean percentages of deciduous and coniferous trees were 51% and 49%, respectively. Graph 9 describes the canopy in South Fork Usal Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 92%. The mean percent left bank vegetated was 94%. The dominant elements composing the structure of the stream banks consisted of 8% bedrock, 1% boulder, 84% cobble/gravel, and 7% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 69% of the units surveyed. Additionally, 8% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on August 10, 1995, in South Fork Usal Creek. The sites were sampled by Craig Mesman (CCC) and Heidi Hickethier (WSP/AmeriCorps).

The first site sampled included habitat units 39 and 40, a low-gradient riffle and step run approximately 1,969 feet from the confluence with Usal Creek. This site had a length of 223 feet. The site yielded forty-seven 0+ steelhead, four 1+ steelhead, six sculpin, and two Pacific giant salamanders.

The second site included habitat units 206-213, a series of pools, riffles, and runs located approximately 9,194 feet above the creek mouth. This site had a length of 189 feet. The site yielded thirty-four 0+ steelhead, nine 1+ steelhead, and four Pacific giant salamanders.

DISCUSSION

South Fork Usal Creek is a C4 channel type for the first 2,857 feet of stream surveyed and an F4 for the remaining 16,140 feet. The suitability of C4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders and log cover; and fair for low-stage weirs, single and opposing wing deflectors, and channel constrictors. F4 channel types are considered: good for bank-placed boulders; fair for low-stage weirs, single and opposing wing deflectors, channel constrictors, and log cover; and poor for medium-stage weirs and boulder clusters.

The water temperatures recorded on the survey days August 8-16, 1995, ranged from 56 to 61 degrees Fahrenheit. Air temperatures ranged from 57 to 76 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 33% of the total **length** of this survey, riffles 27%, and pools 35%. The pools are relatively shallow, with only 74 of the 236 (31%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary

pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

One hundred forty of the 219 pool tail-outs measured had embeddedness ratings of 3 or 4. Only 17 had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In South Fork Usal Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 33. The shelter rating in the flatwater habitats was slightly lower at 26. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by small woody debris in all habitat types. Additionally, large woody debris contributes a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The 17 low gradient riffles measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 97%. This is a relatively high percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

RECOMMENDATIONS

1) South Fork Usal Creek should be managed as an anadromous, natural production stream.

2) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from small woody debris. Adding high quality complexity with woody cover is desirable and in some areas the material is locally available.

3) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

4) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its

tributaries.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Comments:
0'	Begin survey at confluence with Usal Creek. Channel type is C4.
246'	Bridge.
289'	Bank failure 7' high x 50' long contributing gravel and sand.
331'	Left bank erosion felling alders into stream.
1638'	Left bank tributary. Estimated flow <0.1 cfs. Not accessible to fish (NAF).
1935'	Left bank tributary. Estimated flow <0.1 cfs. NAF.
2796'	Corrugated metal pipe culvert 3' diameter x 60' long under seasonal road crossing.
2857'	Channel type changes to F4.
3553'	Left bank seep.
3809'	Two foot diameter CMP culvert on bank.
4491'	Left bank 4' diameter CMP culvert. Estimated outfall <0.1 cfs. NAF.
5791'	Right bank tributary. Estimated flow <0.1 cfs. NAF.
6360'	LDA 8' high x 109' wide x 30' long retaining gravel 7' deep at base.
6440'	Right bank tributary. Estimated flow <0.1 cfs. NAF.
7194'	CMP culvert on bank. Estimated outfall <0.1 cfs. NAF.
7796'	Left bank 2' diameter CMP culvert. Estimated outfall <0.1 cfs. NAF.
8013'	Left bank 2' diameter CMP culvert. Estimated outfall <0.1 cfs. NAF.
8147'	Bridge. 14' clearance.

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8224'	Julias Creek enters right bank (see separate report).
8500'	LDA 6' high x 30' wide x 20' long retaining gravel 5' deep at base. Not a barrier.
10118'	Right bank seep.
10470'	Left bank 5' diameter CMP culvert. Estimated outfall <0.1 cfs. NAF.
11602'	Left bank tributary. Estimated flow <0.1 cfs. NAF.
11940'	Small woody debris accumulation.
12296'	Left bank tributary. Estimated flow <0.1 cfs. Accessible to fish.
13047'	Left bank tributary. Estimated flow <0.1 cfs. Accessible to fish.
13646'	Dry left bank tributary.
13908'	Right bank seep.
13983'	LDA 8' x 20' wide x 10' long retaining sediment 8' deep at base. Not a barrier.
14316'	Left bank tributary. Estimated flow <0.1 cfs. Accessible to fish.
14493'	LDA 15' high x 40' wide x 100' long. Not a barrier.
15584'	LDA 6' high x 30' wide x 40' long retaining sediment 6' deep at base.
16042'	Left bank tributary. Estimated flow <0.1 cfs. Accessible to fish.
16841'	LDA 9' high x 20' wide.
16879'	Left bank tributary.
17187'	Right bank tributary. Estimated flow <0.1 cfs. NAF.
17223'	Right bank seep.
18234'	Dry left bank tributary.
18554'	Right bank failure 30' high x 30' long contributing debris.
18682'	Dry left bank tributary.
18997'	End of survey.

REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5

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